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A breakthrough in health care textiles – antiviral surgical gown

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Abstract

The surgical gowns were originally used to protect patients from post-surgery infection caused by contaminants in the environment. In the recent health care scenario, the function of surgical gowns has become bidirectional. They serve to minimize the cross-infection between patients and health care workers. The health care workers are mainly being exposed to various blood borne pathogens when performing surgeries or post surgeries. The surgical gowns are specifically used to protect the health care workers from being exposed to infectious agent's particularly blood-borne pathogens such as human immunodeficiency virus (HIV), hepatitis B and C virus, which could be acquired by contact between the contaminated body fluids and non-intact skin or mucous membranes. Health care workers in operating rooms, isolation areas, emergency rooms and intensive care units are in absolute and essential necessity of Protective clothing. As a part of personal protection, surgical gowns are used as protective equipment, widely in healthcare facilities. Surgical gowns can be constructed by either single-use materials or reusable materials. Each of these has their own advantages and disadvantages. Woven reusable surgical gowns can be made of tightly woven all-cotton muslin, blended sheeting, polyester sheeting and composite materials.

Key-Words: Surgical gown, Antiviral gown, Drapes

Introduction[1-2]

The barrier efficacy of surgical gowns as a protective equipment has gained importance due to the prevalence of human immunodeficiency virus (HIV) and hepatitis B and C viruses in the patient population. It is a fact that Person, clothing and environment are interactive and interdependent components of garment performance. In this triad, clothing mediates the relationship between person and the environment. It plays an essential role in protecting the body from any hazards in the environment and in maintaining physiological comfort. Protective clothing for biological hazards is used in the health care industry, law enforcement and even mortuary workers.

Infections that become manifest while patients are being treated within healthcare institutions can be defined as Healthcare-associated infections. In this definition, the link between the infection and healthcare is time i.e., the infection becomes manifest during treatment. This definition is especially suitable for the acquisition of healthcare-associated infections in hospitals, commonly referred to as nosocomial infections.

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These infections usually manifest within two days of admission but was not at all incubating at the time of admission. Hence these infections are assumed to be hospital-acquired. Healthcare-associated infections are assumed to possess a causal relationship between the care given and the condition of the patient. Had the patient not received care, he or she would not have acquired a healthcare-associated infection. It is relatively easy to assume a direct causal link between the infection and prior treatment, as in the case of a superficial surgical site infection after surgery. In other cases, the causal relationship may be much less apparent. There may be ways to prevent such healthcare-associated infections; this is the concept upon which infection control is built.

The pathogenesis of healthcare-associated infections is no different from the pathogenesis of infectious diseases in general. Most people microbiologically speaking, remain sterile until birth and are first colonised during birth with bacteria from their mother's birth canal and skin.

Infections can be of two types exogenous or endogenous. Exogenous infections, also called cross-infections, are acquired from the hosts' environment. An apt example is 'catching a cold' from others or from the hands of healthcare personnel. Endogenous infections are caused when commensal flora from the

hosts' own skin or mucous membranes are able to penetrate more deeply into the body.

The history of surgical attire is interesting. Uniforms were long required for nurses. To the greatest wonder, there was no such binding or requirement for surgeons. They directly walked into operating theatres in their street clothes. Surgical procedures were conducted in Operation Theaters, instead of Operating Rooms. These theaters were alike to auditorium-type rooms with a raised central table over the stage and seating arrangements for students and spectators to observe the surgery being performed. Surgeons didn't wear any specialized garment but an ordinary apron (which resembled what a butcher used) over his casual wear. The apron was to protect surgeon's clothes from blood stains and fluids while performing a surgery. Surgeries were performed in an unsterile environment that too with bare-hands. The instruments that were used were not sterile. Re-usable needles were in practice. Cleanliness and the need for sterile conditions were not strongly advocated as in present time. Surgeons had no concern for cleanliness. They did not wash their hands before examining or operating on patients, even after examining an infected corpse. People would relate a successful surgeon with blood and fluid stains on his clothes. Many doctors took pride in the accumulation of blood and pus on their medical garments. This may seem scary in present times but we are talking about time when connection between bacteria and disease was not even established, epidemics of puerperal fever ran across maternity wards, mortality rates for amputation was as high as 50% and much more.

Need of antiviral surgical gown[3-4]

The necessity of barrier protection has become essential as people of today are prone to cross infections. Hence adherence to single-use gowns and drapes have become ideal choices. Barrier properties are of great importance with a different deviation from user comfort and cost to user and patient protection. Dual protection (HCWs and patients) is of paramount importance. Issues of safety and infection control are now being quantified by risk managers; these issues must be in the total equation when choosing between reusable and single-use gowns and drapes.

Gowns and drapes act as barriers to prevent transmission of microorganisms from non-sterile to sterile areas. A critical factor in choosing materials for gowns and drapes is the Impermeability to moisture. Protection of Health care workers from coagulase-negative Staphylococcus aureus, methicillin-resistant Staphylococcus aureus (MRSA) and other resistant organisms, and blood borne pathogens is an absolute necessity for safe practices. Choices are to be made on safety issues as well as cost.

Protective gowns are to be worn whenever there is any potential for blood contact. At least seven cases of job-related HIV sero conversion can tentatively be attributed to mucous membrane or skin splashes with contaminated blood. Blood strike-through, absorbed by a scrub-suit, directly contaminated surgeon's skin. Even small amounts of contaminated "strike-through" blood can have a sufficient inoculum to possibly infect Health care workers including the nurses and surgeons. When protective garments are penetrated by infectious body liquids, microorganisms from the patient can infect the medical staff. Even though the risk is low, reports of HCW seroconversion to positive after contamination by infected blood have been noted. HBV, HCV, and HIV can be acquired via contact of contaminated body fluids with non-intact skin or mucous membranes. OSHA's standard was promulgated to minimize HCWs' risk of acquiring blood borne pathogen diseases. Potentially fatal diseases such as HBV and HIV can be transmitted to medical personnel through body fluids from the patient. Skin is an efficient barrier. But its barrier qualities compromises when exposed to patients' body fluids for prolonged periods of time. Skin's barrier qualities reduce by abrasions.

Selection of gowns and drapes[2-5]

The choice of a single-use gown or drape becomes easier and safer when considering various factors. Factors such as aseptic assurance, comfort, and environmental issues are important considerations. Gowns and drapes must enhance and retain sterility. Gowns and drapes must have flawless barrier qualities, be low-linting, and be of consistent and uniform quality. They also must be effective barriers even in wet conditions i.e., resist liquid penetration.

Additional materials in the form of coatings, reinforcements or laminates are also often added to improve barrier resistance, absorbency and non-slippage. Rutala and Weber (2001) provide the following categorization of reinforcement approaches: reinforced fabric (second layer of fabric used to reinforce base materials); zone-impervious fabric and impervious fabric; liquid-repellent finish; and layered fabric with a highly resistant membrane (between two layers).

Risk for health care workers[5-6]

With the prevalence of human immunodeficiency virus (HIV), hepatitis B and C virus within the health care industry, there is an urgent need to keep health care workers safe from the occupational hazards of being in contact with bodily fluids. More than 2400 health care

workers suffered occupational exposures to bodily fluids from known HIV-infected individuals, with at least 35 resultant seroconversions.

Hepatitis B Virus (HBV) is approximately 10 times as transmissible as HCV. Both the incidence and prevalence of the HBV infection are substantially higher among hospital based health care workers than among the general population. Investigations prove that infections are consistently associated with the degree of occupational blood exposure. An investigation conducted by Levy et al. presented evidence regarding a sharp increase in HBV cases among the 2000 employees of a general hospital during three years. This data corroborates the fact that many Health care workers contract hepatitis B from exposure to patients, especially for those who routinely get blood on their skin and clothes at work.

Challenges in the operating room[4-6]

In the operating theater, body fluids (such as blood and perspiration) from patients and other liquids in the surgery, environment (alcohol, iodine) can act as carriers transporting bacteria through the fabric. The surgical environment presents opportunity for gowns to be wet by these liquids. Therefore, we must consider the barrier fabric's effectiveness in preventing transmission of the bacteria. In addition, the temperature of liquids present in operating room differs. Body fluids will be at a temperature close to the internal body temperature (e.g., 38 C), while other liquids used in the operating room (alcohol, iodine) may be the same as or cooler than ambient temperature.

Virus infection occurs not only by direct contact to virus-containing splash by sneeze or the like discharged by a virus infected person, but also by contact (indirect contact) to clothes, towel, or the like having come in contact with a virus infected person. Mask is generally used for method of prevention of virus infection. However, since viruses will be condensed in a filter part of a mask after long use, contact to the body of the mask at the time of detaching the mask will move the viruses to a hand, and contact of the infected hand to towel and then clothes. Further, contact of a third person to a part where the viruses have attached then makes the viruses attach to the hand of the third person to cause secondary infection.

Hence Antiviral surgical gowns and drapes are an essentiality in today's scenario as the relationship between bacteria and diseases have been established to a deep core. This antiviral surgical gown is a milestone in the vocation of health care workers as this can act as a protective barrier against various bacteria and virus.

References

1. Shozo Shigita, Hideyuki tsurumi and Hideo Naka. (2007). Antiviral fibre, process for Producing the fibre and textile product comprising the fibre, US Patent.
2. Malek J.R. and Speier J.L. (2000). Development of an Organosilicone Antimicrobial Agent for the Treatment of Surfaces. *Journal of Coated Fabrics*, **12**: 38-46
3. Whyte W., Vesley D. and Hodgson R. (1976). Bacterial dispersion in relation to operating room clothing, *Journal of Hygiene*: 367-378.
4. Bernard H.R. (1982). Experiences with reusable barrier materials 1976-90. American College of Surgeons Bulletin: 8-22.
5. Slater K.. and Hilary D. (1985). The design of operating theatre gowns for comfortin surgical procedures, *Clothing Institute Journal.,* 32.
6. Whyte W., Bailey P. V., Hamblen D. L., Fisher W. D. and Kelly I. G. A bacterially occlusive clothing system for use in the operating room. *Journal of Bone and joint Surgery,* **65**: 502-506.